TECHNICAL EVOLUTION OF APIERICAN BROADCAST TRANSMITTERS

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The technical aspects of transmitter design naturally were influenced by the FRC and later the FCC who regulated the broadcasters. Originally there was a state of real chaos before FRC days, when anyone who applied could get a license for a broadcast station. It is difficult to understand the headlong rush for station licenses before the advent of sponsored programs and other spot advertising to support the expenses of operation. Naturally the big companies and stores got publicity. Westinghouse inaugurated broadcasting and built stations as a means for selling their home receivers. Same with G.E.

Early stations were of low power with inefficient antennas. Many were home made. It took some years before a commercial market for transmitters developed. In 1923 two custom made 500 watt transmitters were built by G.E. for RCA's new station on New York's Aeolean Building. Not until 1925 was a commercial product designed for sale in 1926. By then radio advertising had emerged, helped by formation of the National Broadcasting Company that insisted on high quality programs and sponsors. The big broadcasters scorned the many small town stations that filled the day with alternate announcements and a single recorded number. Actually, all AM broadcasting has fallen to that level today.

Advent of super-heterodyne receivers with high sensitivity increased broadcast popularity, especially during "radio golf" days when people competed to hear distant stations. But that faded away as radio became commonplace. Then the competition was for regional or local listening audience, or circulation, a basis for station charges for time. This led to struggles for higher power. The first 50-KW stations appeared in 1927. Soon there were many. Then started the international efforts to reduce mutual interference (North American Regional Broadcasting Agreement) and tighter carrier frequency control to reduce heterodynes on shared channels. In 1935 the prospects for FCC allowing USA stations powers up to 500-KW were promising enough for NBC to order two such transmitters. WLW had been operating at 500 KW experimentally for some months. Eventually, FCC stuck to the 50 KW limit for all time. This did not prevent Mexico and Cuba going to unlimited powers.

At the end of the FRC era, there were about 660 AM stations on the air, ranging from 100 watts to 50,000. Everyone felt that the 550-1600 kc band was saturated. Yet today there are about 4000 AM station in USA. The use of directive antennas did much to permit this expansion. This gives an idea of how the transmitter market developed.

By 1930, typical human factors led to better transmitter styling and elaborate buildings. A few stations made show places of their stations, but largely the money spent in buildings and styling were more to satisfy the buyer's ego. Mostly the equipment at,the station, once installed, was hardly seen by anyone except the operators. Neverless, the appeal of fine "packaging" had its influence on product sales.

The only market for transmitters of more than 50 KW was in foreign sales, competing with European makers. Americans were the first to go to wholly enlosed designs where high voltages were inaccessible to operators as well as others. In 1930, German transmitters were wide open and the danger area was marked by a red-velvet covered rope on brass posts. Greater safety precautions were designed into the equipments here and that same practice followed in Europe.

It wasn't until 1937 that the use of motor-generators for dc filament and grid bias was replaced by all-ac operation. The 100 KW 898 power tube had a 3-phase filament, in place of the predecessor 862 that required dc to avoid hum on the carrier. The trend to oxide-coated tube filaments at the lower power levels naturally minimized hum by being of lower current requirements. The RCA Type 50D transmitter of 1937 was the first to eliminate all rotating machinery except water pumps. The advent of stabilized feedback circuits also helped to reduce spurious hum. "Hum-bucking" techniques were also developed.

Water cooling was always a problem cost-wise and for reliability. In time, the power levels of power tubes air cooled was gradually raised until today water cooling is hardly used at any power level. The problem was not only cooling the tubes but in cooling the cooling water. Spray ponds and various methods of heat exchange from water to air were evolved. Nowadays, a high power transmitter needs immense air ducts and large blowers in duplicate; but it's still cheaper and more reliable than water cooling.

The earliest broadcast transmitters were simple master oscillator power amplifier systems. Necessity caused their elimination in favor of frequency by piezo-electric quartz crystals. The bulk of operating transmitters today are virtually secondary frequency standards, so precise and constant is their operating frequency.

Today, television has so far displaced AM broadcasting in importance that the whole service has become degraded as a source of entertainment. It has become purely utilitarian mainly for motorists. The market for new transmitters is also degraded to utmost first-cost and operating economy. Only a few small manufacturers serve that market today.

Frequency-modulation broadcasting (FM) in the 88-108 Mhz band was initiated as an embrionic service at the time television was breaking out and the former was soon swamped. However, FM was used for television sound transmission. Many AM stations had installed FM transmitters carrying the same or separate programs, only to fail because of popular concentration on television receivers. By the 1950's FM had won back a prominent role in broadcasting, augmented in the 1960’s as the conversion to stereophonic program transmission gave it a unique status.